

CLAIMS

What is claimed:

1. An apparatus for controlled beverage dispensing in a beverage maker, the apparatus comprising:
 - a controller for controlling operation of at least a portion of the beverage maker;
 - a liquid reservoir;
 - an inlet tube communicating with the liquid reservoir;
 - a constant line pressure source communicating with the inlet tube;
 - an inlet valve communicating with the inlet tube positioned between the constant line pressure source and the liquid reservoir and coupled to the controller;
 - a level sensor associated with the liquid reservoir to detect at least one beverage level in the liquid reservoir, the level sensor being coupled to the controller;
 - an outlet tube communicating with the liquid reservoir;
 - an outlet valve communicating with the outlet tube and coupled to the controller; and
 - the controller operating the outlet valve to remain open for a time period, the time period being the longer of an initial time period and an extension time period, the extension time period being the sum of the initial time period and one or more refill periods.
2. The apparatus of claim 1 further comprising the constant line pressure source being a flow regulator.
3. The apparatus of claim 1 further comprising a faucet communicating with the liquid reservoir.
4. The apparatus of claim 1 further comprising an indicator coupled to the controller for indicating the time period is greater than the initial time period.
5. The apparatus of claim 4 further comprising having the indicator be a message indicating preventative maintenance may be required.

6. A beverage dispenser including an apparatus for controlled beverage dispensing, a controller being coupled to the beverage dispenser to controllably operate the beverage dispenser to dispense a predetermined volume of liquid, the apparatus comprising:

- a liquid reservoir;
- an inlet tube communicating with the liquid reservoir;
- a flow regulator communicating with the inlet tube;
- an inlet valve communicating with the inlet tube positioned between the flow regulator and the liquid reservoir and coupled to the controller;
- a level sensor associated with the liquid reservoir to detect at least one beverage level in the liquid reservoir, the level sensor being coupled to the controller;
- an outlet tube communicating with the liquid reservoir;
- an outlet valve communicating with the outlet tube and coupled to the controller; and
- the controller operating the outlet valve to remain open for a time period, the time period being the longer of an initial time period and an extension time period, the extension time period being the sum of the initial time period and one or more refill periods.

7. The beverage dispenser of claim 6 further comprising a faucet communicating with the liquid reservoir.

8. The beverage dispenser of claim 6 further comprising an indicator coupled to the controller for indicating the time period is greater than the initial time period.

9. The beverage dispenser of claim 8, further comprising having the indicator be a message indicating preventative maintenance may be required.

10. A method for dispensing a desired volume of liquid using a beverage dispenser, the method comprising the steps of:

- providing a controller for controlling operation of at least a portion of the beverage maker;
- providing a liquid reservoir;
- providing an inlet tube communicating with the liquid reservoir;
- providing a constant line pressure source communicating with the inlet tube;
- providing an inlet valve communicating with the inlet tube;

providing a level sensor associated with the liquid reservoir to detect at least one beverage level in the liquid reservoir, the level sensor being coupled to the controller;

providing an outlet tube communicating with the liquid reservoir;

providing an outlet valve communicating with the outlet tube and coupled to the controller;

opening the outlet valve for an initial time period to dispense a volume of liquid; and

performing a routine until the desired volume has been dispensed, comprising the steps of:

(a) calculating the volume of liquid dispensed;

(b) performing a comparison of the volume of liquid dispensed to the desired volume of liquid and in response to the comparison resulting in the volume of liquid dispensed being equal to or greater than the desired volume, closing the outlet valve; and

(c) in response to the volume of liquid dispensed being less than the desired volume of liquid, opening the inlet valve for a refill period, the refill period ending when the level sensor senses a liquid level in the liquid reservoir has reached a preselected level.

11. The method of claim 10, further comprising the step of filling the liquid reservoir to a preselected level prior to opening the outlet valve for an initial time period to dispense a volume of liquid.

12. The method of claim 10, further comprising having the line pressure source be a flow regulator.

13. The method of claim 12, further comprising having the step of calculating the volume of liquid dispensed be performing the steps of:

operating the flow regulator to maintain a preselected liquid flow rate in an entry section of the inlet tube, the entry section being a section of the inlet tube between the flow regulator and the inlet valve;

during operation of the inlet valve, measuring each time interval the inlet valve remains open;

calculating the volume of liquid dispensed by multiplying a sum of the time intervals by the preselected liquid flow rate.

14. The method of claim 13, further comprising having the refill period end when both the level sensor senses a liquid level in the liquid reservoir has reached a preselected level and a minimum preselected refill period has expired.
15. The method of claim 10, further comprising providing a faucet in communication with the beverage reservoir, and selectively using the faucet to dispense liquid.
16. The method of claim 10, further comprising providing an indicator in communication with the controller for indicating a time period is greater than the initial time period, the time period being the sum of the each refill period and the initial time period.
17. The method of claim 16, further comprising the indicator being a message indicating that preventative maintenance may be needed.
18. The method of claim 16, further comprising controllably operating the outlet valve to operate in a pulse brewing mode during dispensing.
19. The method of claim 10, further comprising locking out further dispensing of liquid if the difference between the time period and initial time period is greater than a selected limit, the time period being the sum of each refill period and the initial time period.
20. The method of claim 10, further comprising operating the outlet valve in a pulse-brew mode during dispensing.
21. A system in combination with a beverage dispenser for controlled beverage dispensing, the system comprising:
 - a controller for controlling operation of at least a portion of the beverage maker;
 - a liquid reservoir;
 - a dispensing assembly including an inlet tube communicating with the liquid reservoir, a constant line pressure source communicating with the inlet tube, an inlet valve communicating with the inlet tube positioned between the constant line pressure source and the liquid reservoir and coupled to the controller, a level sensor associated with the liquid reservoir to detect at least one beverage level in the liquid reservoir,

the level sensor being coupled to the controller, an outlet tube communicating with the container, an outlet valve communicating with the outlet tube and coupled to the controller, the controller operating the outlet valve to remain open for a time period, the time period being the longer of an initial time period and an extension time period, the extension time period being the sum of the initial time period and one or more refill periods; and

an apparatus for producing a beverage communicating with the dispensing assembly for receiving liquid from the dispensing assembly and controllably dispensing a beverage therefrom in response to a control signal from the controller.

22. The system of claim 21 further comprising:

a volume of beverage preparation material retained in the apparatus for producing a beverage; and

a container for combining a volume of liquid dispensed by the dispensing apparatus with the volume of beverage preparation material to create a beverage.

23. The system of claim 21 further comprising a faucet in communication with the dispensing assembly.

24. The system of claim 21 further comprising an indicator for indicating the time period is greater than the initial time period.

25. The system of claim 24 further comprising the indicator being a message indicating preventative maintenance may be required.

26. The system of claim 22 further comprising the liquid being water, the beverage preparation material being ground coffee, and the beverage being coffee.

27. A kit for use with beverage maker, the beverage maker comprising a dispensing assembly including an inlet tube communicating with the liquid reservoir, an inlet valve communicating with the inlet tube and coupled to a controller, a level sensor associated with the liquid reservoir to detect at least one beverage level in the liquid reservoir, the level sensor being coupled to the controller, an outlet tube communicating with the container, and an outlet valve communicating with the outlet tube and coupled to the controller, the kit comprising:

a flow regulator to be associated with the inlet tube and coupled to the controller; and

a software module for operating the controller to operate the outlet valve to remain open for a time period, the time period being the longer of an initial time period and an extension time period, the extension time period being the sum of the initial time period and a refill period.

28. The kit of claim 27, the software module further being operative to operate the outlet valve in a pulse brew mode.

29. A kit for use with beverage maker, the beverage maker including an inlet tube communicating with the liquid reservoir, a constant line pressure source communicating with the inlet tube, an inlet valve communicating with the inlet tube and coupled to the controller, a level sensor associated with the liquid reservoir to detect at least one beverage level in the liquid reservoir, the level sensor being coupled to a controller, an outlet tube communicating with the container, an outlet valve communicating with the outlet tube and coupled to the controller, the kit comprising:

a software module for operating the controller to operate the outlet valve to remain open for a time period, the time period being the longer of an initial time period and an extension time period, the extension time period being the sum of the initial time period and one or more refill periods.

30. The kit of claim 29, the software module being further operative to operate the outlet valve in a pulse brew mode.

31. An apparatus for controlled beverage dispensing in a beverage maker, the apparatus comprising:

a controller for controlling operation of at least a portion of the beverage maker;

a liquid reservoir;

an inlet tube communicating with the liquid reservoir;

a constant pressure liquid source;

an inlet valve communicating with the inlet tube positioned between the constant pressure liquid source and the liquid reservoir and coupled to the controller;

a level sensor associated with the liquid reservoir to detect at least one beverage level in the liquid reservoir, the level sensor being coupled to the controller;
an outlet tube communicating with the liquid reservoir;
an outlet valve communicating with the outlet tube and coupled to the controller; and
the controller operating to adjust an outlet time for operating the outlet valve to remain open after a brew cycle in response to detecting an obstruction in the outlet tube by monitoring the time the inlet valve remains open during a dispensing cycle.

32. The apparatus of claim 31 further comprising the constant line pressure source being a flow regulator.

33. The apparatus of claim 32 further comprising a faucet communicating with the liquid reservoir.

34. The apparatus of claim 31 further comprising an indicator coupled to the controller for indicating the time period is greater than the initial time period.

35. The apparatus of claim 34 further comprising having the indicator be a message indicating preventative maintenance may be required.

36. A method for dispensing a desired volume of liquid using a beverage dispenser, the method comprising the steps of:

providing a controller for controlling operation of at least a portion of the beverage dispenser;

providing an inlet water delivery assembly, the inlet water delivery assembly having an inlet valve for controlling water flow through the water delivery assembly and coupled to the controller;

providing a level sensor associated with the inlet water delivery assembly to detect at least one liquid level in the water delivery assembly, the level sensor being coupled to the controller;

providing an outlet tube communicating with the inlet water delivery assembly;

providing an outlet valve communicating with the outlet tube and coupled to the controller;

setting a first outlet time;
setting a first inlet time;
setting the second outlet time to initially be equal to the first outlet time;
during each brew cycle, opening the outlet valve for the second outlet time to cause liquid to be begin to dispense out from the inlet water delivery assembly;
iteratively opening the inlet valve in response to the level sensor sensing the liquid level in the inlet water delivery assembly has fallen below a preselected level and closing the inlet valve in response to the level sensor sensing the liquid level has risen at least to the preselected level, while simultaneously having the controller monitor a second inlet time, the second inlet time being a total time the inlet valve remains open during that brewing cycle; and
in response to the difference between the first inlet time and second inlet time being greater than an adjustment trigger time, increasing the second outlet time by an increment.

37. The method of claim 36, further comprising the steps of:
providing a liquid reservoir of the inlet water delivery assembly;
providing an inlet tube of the inlet water delivery assembly, the inlet tube communicating with the liquid reservoir and the inlet valve; and
providing a constant line pressure source of the inlet water delivery assembly, the constant line pressure source communicating with the inlet tube.
38. The method of claim 36, further comprising the step of: in response to the second outlet time being greater than a preselected maintenance time, activating a maintenance indicator.
39. The method of claim 36, further comprising setting the adjustment trigger time to be a percentage of the first inlet time.
40. The method of claim 36, further comprising the step of: in response to the second outlet time being greater than a preselected maintenance time, having the controller lock out operation of the beverage dispenser.
41. The method of claim 36, the step of setting a first outlet time being setting the outlet time to be a factory preset time.

42. The method of claim 36, the step of setting a first outlet time being setting the outlet time to a time determined during a calibration process to be a time needed to dispense a desired volume.

43. The method of claim 36, further comprising the step of operating the outlet valve in a pulse brew mode.